Characterization of AF drivers maintaining long-lasting AF: New insight from the distribution and spatiotemporal stability

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Introduction: Characteristics of atrial fibrillation (AF) drivers maintaining AF in patients with long-lasting persistent AF are associated with mechanistic importance. We evaluated the regional distribution and spatiotemporal stability of the potential AF drivers before ablation.

Methods: Overall 15 patients with long-lasting persistent AF were included in this study. AF was mapped in patients using the CARTOFINDER system (Carto 3, V7) with the PENTARAY catheter to identify focal drivers with rotational activities before ablation. According to the AF driver distribution, pulmonary vein isolation (PVI) was performed with wide circumferential isolation encircling drivers adjacent to the PVs and followed by substrate ablation targeting the drivers. Electric cardioversion was performed if failed restoration of sinus rhythm by catheter ablation.

Result: There were 15 patients receiving ablation (age: 54.0 ± 9.9-year-old, 86.7% male). Procedural termination was observed in 3 patients (20.0%, one with PVI and 2 with driver ablation). The average number of focal drivers was 3.9, and the rotor driver was 0.4 per chamber. Majority of the patients had rotor drivers at the PV/antral region, and all patients had focal drivers at the PV/antral region (Figure 1). Compared with the rest of the non-driver region, focal driver sites correlated with the spatiotemporal stability of the bipolar electrogram (similarity), and the recurrence patterns last for a mean duration of 338.2 ± 225.1 ms (periodicity) (Table 1). Focal and rotational drivers demonstrated the spatial stability marker of divergent force from phase mapping (Figure 2), and rotational force for the rotors (Figure 3).

Conclusion: Most drivers in persistent AF were identified near the PV/Antral region (57.1% of focal and 44.3% of the rotor, which could be identified in all patients before PV isolation. AF drivers showed spatiotemporal stability and regional rotational or divergence activities.